



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,961	09/30/2003	Florence R. Pon	42P17605	8131
8791	7590	05/19/2006	EXAMINER	
BLAKELY SOKOLOFF TAYLOR & ZAFMAN 12400 WILSHIRE BOULEVARD SEVENTH FLOOR LOS ANGELES, CA 90025-1030			CHU, CHRIS C	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 05/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary

Application No.

10/676,961

Applicant(s)

PON ET AL

Examiner

Chris C. Chu

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 February 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 32 is/are pending in the application.
- 4a) Of the above claim(s) 3 - 5 and 11 - 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 6 - 10, 31 and 32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on February 27, 2006 has been received and entered in the case.

Election/Restrictions

2. Newly submitted claims 11 – 20 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claims 11 – 20 are drawn to a Species III (an alternate staggered arrangement in one dimension) because, claims 11 – 20 recite the following sentence, “stacking a plurality of dies having at least three dies on top of one another in a staggered configuration ...”. This limitation presents the claims 11 – 20 directed to an invention distinct from an independent of the elected invention (Species I – a staircase arrangement in one dimension) previously claimed. Since applicant elected Species I (Fig. 2A), the claims 11 – 20 are withdrawn from consideration as being directed to a non-elected invention. Applicant should note that applicant can not shift to claiming another invention after an election is once made and action given on the elected subject matter (see MPEP 819).

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 11 – 20 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

On page 7, applicant argues, “applicants used the term ‘embodiment’ in the remark section to show a variation of the design, not a ‘species’.” This argument is not persuasive because the variation of the design differences of instant invention is a clear admission of applicant that the disclosure of instant invention contains mutually exclusive and patentably distinct designs. For example, claim 3 contains mutually exclusive limitations, “attaching upper and lower conductors to upper and lower bond pads of the first and second dies at the **upper third and the lower first edges**”. In order to attach upper conductors on the upper third edge of the first die and lower conductors on the lower first edge of second die, the upper die’s bottom surface (non-active surface or non-pad surface) is attached to the upper surface or active surface of the lower die (see e.g., Fig. 5 of instant invention), which is mutually exclusive and patentably distinct design variation from Figs. 2A and 2B and claim 1 of instant invention. Thus, the recited limitation in claim 3 does not find in Species I (Figs. 2A and 2B) and the recited limitation in claim 1 does not find in i.e., Species IV (Fig. 5), as recited in MPEP 806.04(f). Since the claims 1 and 3 contain mutually exclusive and patentably distinct limitations, the claims 1 and 3 are different species. Thus, the species restriction is proper.

Furthermore, applicant argues, “claim 14 does not recite ‘limitation disclosed only for the second species and not the first’. Therefore, claims 13 and 14 are mutually exclusive according to the test provided by MPEP 806.04(f).” This argument is not persuasive. The elected Species I (Figs. 2A and 2B) does not have a limitation of the “second dimension” and the limitation “second dimension” in claim 14 is disclosed only in the Species II (Fig. 3), as recited in MPEP

Art Unit: 2815

806.04(f). Since the claims 13 and 14 contain mutually exclusive and patentably distinct limitations, the claims 13 and 14 are different species. Thus, the species restriction is proper.

As pointed out above, the figures and their associated claims include mutually exclusive limitations and thus are independent. The arguments to the contrary are not persuasive; the requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 2, 6 – 10, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (U. S. Pat. No. 6,476,474) in view of Khandros et al. (U. S. Pat. No. 5,998,864).

Regarding claims 1 and 31, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 a method comprising:

- stacking an upper die (200) having upper top and bottom surfaces and upper first, second, third, and fourth edges on top of a lower die (100) having a lower top surface and lower first, second, third, and fourth edges such that the upper first edge is displaced from the lower first edge by a first distance, the upper first and third edges being opposite to each other, the lower first and third edges being opposite to each other, the upper bottom surface (where the bond pads are located on the die 200) facing toward the lower top surface (where the bond pads are located on the die 100)

such that bond pads (210) on the upper die (200) facing downward while bond pads (110) on the lower die (100) facing upward (see e.g., Fig. 2F);

- attaching the upper die (200) to the lower die (100) with an adhesive layer (220; column 4, lines 5 – 6) between the upper and lower dies (see Fig. 2F); and
- attaching upper (420) and lower (410) conductors to upper (210) and lower (110) bond pads of the upper (200) and lower (100) dies at the upper and lower first edges, respectively, such that the upper and lower conductors are separated by a conductor distance (claim 31). Furthermore, the terms “top” and “bottom” die surfaces are merely relative terms, which do not patternably distinguish claimed structure over Hung.

However, Hung does not disclose a step of attaching a third die to the upper die in a stair-case configuration. Khandros et al. teaches in e.g., Fig. 4A and column 6, lines 40 – 45 a step of attaching a third die (406) on an upper die (404) such that a lower die (402), the upper die (404) and the third die (406) are stacked in a stair-case configuration (see e.g., Fig. 4A). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to attach the third die of Khandros et al. on the upper die of Hung as taught by Khandros et al. to increase the power and function of the semiconductor package without charge large area on the PCB and to provide an easy inventorying semiconductor devices (column 2, lines 24 – 26 and column 7, lines 35 – 39).

Regarding claim 2, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: attaching upper (420) and lower (410) conductors to upper (210) and lower

Art Unit: 2815

(110) bond pads of the upper (200) and lower (100) dies at the upper and lower first edges, respectively, such that the upper and lower conductors are separated by a conductor distance.

Regarding claim 6, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: attaching the lower die (100) to a substrate (330) by a second adhesive layer (120; column 3, line 66) deposited between the lower die and the substrate (see Fig. 2F).

Regarding claim 7, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: depositing an upper redistribution layer (a layer that contains the bond pads 210 and provides electrical connections between the bond pads 210 and internal elements inside of the upper die 200; column 3, lines 43 – 47) to place bond pads (210) on the upper die (200).

Regarding claim 8, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 further comprising: depositing a lower redistribution layer (a layer that contains the bond pads 110 and provides electrical connections between the bond pads 110 and internal elements inside of the lower die 100; column 3, lines 38 – 42) to place bond pads (110) on the lower die (100).

Regarding claim 9, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 stacking the upper die (200) comprising stacking the upper die (200) on top of the lower die (100), the upper and lower die having same or “substantially” similar sizes.

Regarding claim 10, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 attaching comprising attaching the upper die (200) to the lower die (100) by the first adhesive layer (220) made of a non-conductive or conductive material. Furthermore, since adhesive layer must be made of either a non-conductive or conductive material, the claimed adhesive layer is held fully met by Hung.

Regarding claim 32, Hung discloses in e.g., Fig. 2F and column 3, line 34 – column 4, line 7 stacking the upper die such that the upper top surface or the upper bottom surface faces the lower top surface.

Response to Arguments

5. Applicant's arguments filed on February 27, 2006 have been fully considered but they are either moot in light of the new grounds of rejection or are not persuasive.

On page 11, applicant argues, “there is no suggestion or motivation to combine their teachings, and thus no prima facie case of obviousness has been established.” Contrary to applicant's assertion and as stated in the rejection, motivation was established by Khandros et al., specifically in column 2, lines 24 – 26 and column 7, lines 35 – 39 (increase the power and function of the semiconductor package without charge large area on the PCB and to provide an easy inventorying semiconductor devices). Applicant should note that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Furthermore, applicant argues “Hung and Khandros et al., taken alone or in any combination, do not disclose, suggest, or render obvious, at least one of (1) stacking an upper die having upper top and bottom surfaces and upper first, second, third, and fourth edges on top of a

Art Unit: 2815

lower die having a lower top surface and lower first, second, third, and fourth edges such that the upper first edge is displaced from the lower first edge by a first distance, the upper first and third edges being opposite to each other, the lower first and third edges being opposite to each other, (2) the upper bottom surface facing toward the lower top surface such that bond pads on the upper die facing downward while bond pads on the lower die facing upward; and (3) attaching the upper die to the lower die with an adhesive layer between the upper and lower dies; and (4) attaching the upper die to a third die such that a lower die, the upper die and the third die are stacked in a stair-case configuration, as recited in claims 1 and 31.” This argument is not persuasive because Hung and Khandros et al. disclose (1) stacking an upper die (200 of Hung) on top of a lower die (100), (2) an upper bottom surface (where the bond pads are located on the die 200) facing toward an lower top surface (where the bond pads are located on the die 100) such that bond pads (210) on the upper die (200) facing downward while bond pads (110) on the lower die (100) facing upward (see e.g., Fig. 2F of Hung); (3) attaching the upper die (200) to the lower die (100) with an adhesive layer (220; column 4, lines 5 – 6) between the upper and lower dies (see Fig. 2F of Hung); and (4) attaching a third die (406 of Khandros et al.) on an upper die (404) such that a lower die (402), the upper die (404) and the third die (406) are stacked in a stair-case configuration (see e.g., Fig. 4A of Khandros et al.; see paragraph four of this Office action for detail.).

Even further, Hung discloses in e.g., Fig. 2F and column 3, lines 38 – 42 a redistribution layer (a layer that contains the bond pads 110 and provides electrical connections between the bond pads 110 and internal elements inside of the lower die 100; Hsuan et al., cited herein for

Art Unit: 2815

evidence purpose, clearly shows in Fig. 3 and column 3, lines 23 – 25 the circuit layer of Hung does in fact read as the redistribution layer). Inherently, the circuit surfaces (100a and 200a) in the upper (200) and lower (100) dice contains a circuit layer that provides electrical connections between the bond pads (110 and 210) and internal elements inside of the upper (200) and lower (100) die. Thus, this circuit layer of Hung read as a redistribution layer.

Next, applicant argues that Khandros does not disclose the upper bottom surface facing toward the lower top surface such that bond pads on the upper die facing downward while bond pads on the lower die facing upward. This argument is not persuasive because Hung, the main reference, clearly discloses in e.g., Fig. 2F the upper bottom surface (where the bond pads are located on the die 200) facing toward an lower top surface (where the bond pads are located on the die 100) such that bond pads (210) on the upper die (200) facing downward while bond pads (110) on the lower die (100) facing upward. Furthermore, the only teaching from Khandros, the secondary reference, is a step of attaching a third die (406) on an upper die (404) such that a lower die (402), the upper die (404) and the third die (406) are stacked in a stair-case configuration (see e.g., Fig. 4A). Thus, Khandros does not have to teach “the upper bottom surface facing toward the lower top surface such that bond pads on the upper die facing downward while bond pads on the lower die facing upward”. In other words, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Finally, Applicant argues that no motivation to combine Hung with Khandros et al. existed because the Examiner's motivation to combine -spacer-less stacking- is taken from Applicant's specification (REMARKS, pages 12 and 13). The Examiner understands this argument to be an assertion of improper hindsight. However, this argument is not persuasive because the Khandros et al. reference also teaches the motivation of spacer-less stacking, as well as additional benefits afforded by that invention (column 2, lines 24 – 26 and column 7, lines 35 – 39). Furthermore, applicant should note that it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

For the above reasons, the rejection is maintained.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

Art Unit: 2815

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is 571-272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu
Examiner
Art Unit 2815

c.c.
Monday, May 08, 2006



SPE Kenneth Parker